

CLAIMS

What is claimed is:

- 1 1. A method, comprising:
2 representing a charge pump output signal as a superposition of current
3 steps that step in opposite directions at different times.
- 1 2. The method of claim 1 further comprising determining a filter output
2 voltage that results from said charge pump output signal by adding current step
3 responses to each of said current steps.
- 1 3. The method of claim 1 wherein a first of said current steps occurs when a
2 reference clock edge rises.
- 1 4. The method of claim 3 wherein said first current step is in a positive
2 direction.
- 1 5. The method of claim 1 wherein a second of said current steps occurs when
2 voltage controlled oscillator output clock edge rises.
- 1 6. The method of claim 5 wherein said second current step is in a negative
2 direction.
- 1 7. A method, comprising:
2 a) calculating a filter output voltage by adding a pair of current step
3 responses to a summation of prior pairs of current step responses;

4 b) calculating an instant of time when an integration of said filter
5 output voltage will reach a reference voltage;
6 c) triggering a voltage controlled oscillator output clock edge at said
7 instant of time; and
8 d) stepping a pair of current steps at a temporal offset with respect to
9 one another, said temporal offset equal to a difference between a rising voltage
10 controlled oscillator output clock edge instant of time and a rising reference clock
11 edge instant of time.

1 8. The method of claim 7 wherein said stepping a pair of current steps
2 further comprises stepping a first current step at said rising reference clock edge
3 instant of time.

1 9. The method of claim 8 wherein said first current step is positive.

1 10. The method of claim 8 wherein said stepping a pair of current steps
2 further comprises stepping a second current step at said rising voltage controlled
3 oscillator output clock edge instant of time.

1 11. The method of claim 10 wherein said second current step is negative.

1 12. The method of claim 7 further comprising setting said integration of said
2 filter voltage to zero after said reference voltage is reached.

1 13. The method of claim 7 wherein said calculating corresponds to a
2 recalculation of when said filter voltage will reach said reference voltage, said

3 pair of current step responses produced by a lagging rising voltage controlled
4 oscillator output clock edge.

1 14. A machine readable medium having stored thereon sequences of
2 instructions which are executable by a digital processing system, and which,
3 when executed by the digital processing system, cause the system to perform a
4 method comprising, comprising:
5 representing a charge pump output signal as a superposition of current
6 steps that step in opposite directions at different times.

1 15. The machine readable medium of claim 14 wherein said method further
2 comprises determining a filter output voltage that results from said charge pump
3 output signal by adding current step responses to each of said current steps.

1 16. The machine readable medium of claim 14 wherein a first of said current
2 steps occurs when a reference clock edge rises.

1 17. The machine readable medium of claim 16 wherein said first current step
2 is in a positive direction.

1 18. The machine readable medium of claim 14 wherein a second of said
2 current steps occurs when voltage controlled oscillator output clock edge rises.

1 19. The machine readable medium of claim 18 wherein said second current
2 step is in a negative direction.

1 20. A machine readable medium having stored thereon sequences of

2 instructions which are executable by a digital processing system, and which,

3 when executed by the digital processing system, cause the system to perform a

4 method comprising:

5 a) calculating a filter output voltage by adding a pair of current step

6 responses to a summation of prior pairs of current step responses;

7 b) calculating an instant of time when an integration of said filter

8 output voltage will reach a reference voltage;

9 c) triggering a voltage controlled oscillator output clock edge at said

10 instant of time; and

11 d) stepping a pair of current steps at a temporal offset with respect to

12 one another, said temporal offset equal to a difference between a rising voltage

13 controlled oscillator output clock edge instant of time and a rising reference clock

14 edge instant of time.

1 21. The machine readable medium of claim 20 wherein said stepping a pair of

2 current steps further comprises stepping a first current step at said rising

3 reference clock edge instant of time.

1 22. The machine readable medium of claim 21 wherein said first current step

2 is positive.

1 23. The machine readable medium of claim 21 wherein said stepping a pair of
2 current steps further comprises stepping a second current step at said rising
3 voltage controlled oscillator output clock edge instant of time.

1 24. The machine readable medium of claim 23 wherein said second current
2 step is negative.

1 25. The machine readable medium of claim 20 wherein said method further
2 comprises setting said integration of said filter voltage to zero after said
3 reference voltage is reached.

1 26. The machine readable medium of claim 20 wherein said calculating
2 corresponds to a recalculation of when said filter voltage will reach said
3 reference voltage, said pair of current step responses produced by a lagging
4 rising voltage controlled oscillator output clock edge.

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